

Appl. No. 09/838,070
Amendment Dated July 16, 2003
Reply to Office Action of May 7, 2003

REMARKS/ARGUMENTS

In the Office Action dated May 7, 2003, the Examiner (1) rejected certain claims under 35 USC §102(b) as being anticipated by WO99/37580 (*Mercera et al.*), and (2) rejected certain claims under 35 USC §103(a) as being unpatentable over *Mercera et al.* in view of U.S. Patent No. 5,883,133 (*Hershkowitz et al.*) and U.S. Patent No. 4,087,259 (*Fujitani et al.*), separately and in combination. Applicants respectfully request consideration of the foregoing amendments and the following remarks and arguments, and withdrawal of the rejections.

Status of the Claims

Claims 1, 2, 15, 16, 28, 29, 35 and 36 have been canceled.

Claims 3-6, 9-14, 17-21, 24-27, 30-34 and 37-38 have been amended.

New claims 39-43 have been added.

Rejection Under 35 U.S.C. § 102(b)

Claims 1-3, 9-18, 24-27 and 35-37 stand rejected under 35 U.S.C. § 102(b) as being anticipated by *Mercera et al.* The Examiner points out that the catalyst of the *Mercera et al.* reference may be unsupported (p. 4, lines 28-32 of *Mercera et al.*). Claims 1, 2, 16, 28, 29 and 35 have been canceled and claims 3, 17, 30 and 37 have been rewritten in independent form incorporating all of the limitations of canceled claims 1-2, 16, 28-29 or 35-36, as applicable. Claim 30 requires preheating the feed gas stream to a temperature between range of 50°C and 700°C, instead of reciting 350°C. This change is supported in the specification at paragraph [0018] of the specification, and in original claims 7 and 22, for example. The feed gas stream preheat temperature limitation "at least about 350°C" of original claim 28 (now canceled) has been inserted by amendment into paragraph [0018].

New independent claims 3, 17, 30 and 37 more clearly express the monolithic metal foam characteristic of the catalyst, as well as requiring that it have 20-100 pores per inch and 75-90% by volume pores. Accordingly, Applicants respectfully traverse this rejection for at least the reason that the term "unsupported," as employed in the reference, does not appear to refer to metal foam monolith structures. See page 7, line 27 - page 8, line 2 of *Mercera et al.* which, after describing suitable techniques for impregnating a carrier, goes on to state,

An alternative suitable technique for associating the metal and cation is solution drying, in the event that the metal and cation are unsupported or are to be supported in a separate stage. Preferably, drying is of a mixture of solutions as hereinbefore defined for impregnation purpose. Alternatively, drying may be sequential with first stage drying and calcining of catalytically active metal solution, followed by

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dispersing the metal cation solution or a mixture thereof with the catalytically active metal solution and drying. [underlining added for emphasis]

Clearly the "unsupported" catalyst compositions of *Mercera et al.* are not compatible with the Examiner's interpretation as expressed in the Office Action of May 7, 2003. There is no teaching or suggestion that the resulting unsupported catalyst is in the form of a metal foam monolith. In *Mercera et al.* it appears that even the ceramic foam supports were crushed and sieved to 30/80 mesh particles before impregnation with the metal salts. The exemplary catalysts of *Mercera et al.* are in the form of foam particles (Examples 1-3) or a powder (Example 4). The only monolith catalyst structures suggested by *Mercera et al.* appear to contain ceramic foams, refractory oxide honeycomb monolith structures or metal gauze structures (page. 12, lines 14-21). None of those catalyst structures is a metal foam monolith catalyst as recited in Applicants' claims 3, 9-14, 17-18, 24-27 and 37, as currently amended.

By contrast, currently amended independent claims 3 and 17 require a "monolithic porous metal ~~foam~~ catalyst" and claim 35 requires a "porous rhodium foam monolithic catalyst." In paragraph 22 of Applicants' specification it is stated that "[t]he foam ... is essentially monolithic, inasmuch as it is a continuous, albeit porous, self-supporting structure." It is plain that the catalyst of *Mercera et al.* is not the same as that of Applicants' claims 3, 9-14, 17-18, 24-27 or 37, as currently amended.

With respect to claims 3 and 17, the Office Action states,

[s]ince *Mercera et al.* discloses a monolithic porous metal catalyst comprised of unsupported Rh, it would have been inherent to one of ordinary skill in the art to expect the foam to have been capable of having the desired foam properties in order to have an exceptional catalyst. [underlining added for emphasis]

To anticipate a claim, a single reference must teach every element of the claim -- either expressly or inherently (MPEP 2131.01). The MPEP 2112 also states that, if inherency is asserted, the Examiner must provide rationale or evidence tending to show inherency. More specifically,

[i]f relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art. *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990).

and

[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531,

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1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993) (reversed rejection because inherency was based on what would result due to optimization of conditions, not what was necessarily present in the prior art)

Applicants respectfully submit that the Examiner's conclusion that "*Mercera et al.* disclose a monolithic porous metal catalyst comprised of unsupported Rh" is incorrect, and therefore cannot provide a factual basis for any theory of inherency. Moreover, there is no technical reasoning in the Office Action as to why the specific "desired foam properties" recited in claims 3 and 17 would necessarily and inevitably flow from the teachings of the reference. It is noteworthy that *Mercera et al.* emphasize that selected modifiers have a beneficial influence on the methane conversion, ammonia production and catalyst stability (page 17, lines 1-4), without mention of any specific catalyst structural requirements. Also, at page 3, lines 8-32, *Mercera et al.* describe the conflict between individual optimizations of various performance parameters of a catalytic partial oxidation reaction. In light of those teachings, the exact properties of the catalyst of Applicants' claims 3 and 17 could not be inherent in any catalyst disclosed by *Mercera et al.* Clearly, without Applicants' disclosure, extensive experimentation would be required by the artisan to arrive at Applicants' claimed process employing the recited catalyst.

It is said in the Office Action that *Mercera et al.* discloses the same operating pressure, the oxygen-to-carbon ratio, the methane content of the feed, the hydrocarbon and carbon monoxide selectivities and the space velocity, of claims 9-14, respectively. In reply, Applicants respectfully traverse that at least the reason that (without admitting that such is the case) even if the process of *Mercera et al.* were operated at Applicants' recited operating pressure, the oxygen-to-carbon ratio, the methane content of the feed, the hydrocarbon and carbon monoxide selectivities, and space velocity, the process would still not be the same as any of currently amended claims 9-14 because of the underlying differences in the catalyst employed by *Mercera et al.*

For at least the foregoing reasons, claims 3, 9-14, 17, 18, 24-27 and 37, as currently amended, distinguish over *Mercera et al.*

Rejection: Under 35 U.S.C. § 103(a)

Claims 4, 6-8, 19, 21-23, 28-31, 33 and 34 stand rejected in the Office Action of May 7, 2003 under 35 U.S.C. § 103(a) as being unpatentable over *Mercera et al.* in view of *Hershkowitz et al.* The Examiner acknowledges that *Mercera et al.* does not teach the limitations of those claims, but

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takes the position that *Hershkowitz et al.* also discloses a partial oxidation process and provides each of the claim limitations not present in *Mercera et al.* Suitable catalyst compositions for use in the catalytic partial oxidation process of *Hershkowitz et al.* are described at col. 9, line 54 - col. 10, line 22. While *Hershkowitz et al.* suggest that the catalytically active metal may be used in metallic form, as in wire mesh or metal shot or metal monolith, this does not amount to a teaching of a metal foam monolith catalyst with the exact pore volume and size characteristics of currently amended claims 3, 17 and 30. Given the teaching in *Mercera et al.* (page 3, lines 11-13) that while it is possible to optimize in terms of individual performance parameters, conflicts between individual optimizations occur such that it is not possible to operate a process with simultaneous optimization of all conditions, one of ordinary skill in the art would, therefore, not "expect the foam to have been capable of having the desired foam properties in order to have an exceptional catalyst," contrary to the Examiner's suggestion in item 2 of the Detailed Action. There is no teaching or suggestion in *Hershkowitz et al.* that would lead the artisan to employ the same rhodium foam monolith catalyst recited in Applicants' claims 3, 17 and 30.

Claims 5 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mercera et al.* in view of *Fujitani et al.* While acknowledging that *Mercera et al.* does not disclose preheating of the catalyst, the Examiner suggests that *Fujitani et al.* teaches (at col. 2, lines 30-33) a rhodium catalyst that exhibits consistent activity either in the form of a metal or in the form of an oxide and that it would, therefore, have been obvious to preheat the catalyst and use the oxidized catalyst in a partial oxidation process. It should be noted, however, that *Fujitani et al.* goes on to teach at col. 2, lines 33-39,

rhodium may be used alone as the catalyst, for example, in the form of a screen of metallic rhodium. Since rhodium is expensive but has high activity, it is preferred, as is the case with general catalysts, that rhodium be supported on a carrier having, for example, a granular form or a honeycomb structure.

The exemplary catalysts of *Fujitani et al.* contain a small amount of rhodium supported on 3 mm diameter spheres or supported on a honeycomb carrier (Examples 1-7). In the present case, claims 5 and 20 have been amended to change their dependency from now-canceled claims 1 and 15, respectively, to claims 3 and 17. Without admitting that the references are combinable, even if *Fujitani et al.* were to employ a metallic rhodium catalyst in its oxide form, it would still not provide a process for the catalytic partial oxidation of a hydrocarbon feedstock employing a rhodium foam

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monolith catalyst having 75-90 % (by volume) pores and 20-100 pores per inch. The exact properties of the catalyst of Applicants' claims 5 and 20, which depend from claim 3 or 17, are not inherent in any catalyst of *Mercera et al.* for at least the same reasons as discussed above with respect to the rejections under 35 U.S.C. § 102(b) of independent claims 3 and 17.

Claims 32 and 38 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Mercera et al.* in view of *Herschkowitz et al.* and further in view of *Fujitani et al.* The Examiner is of the opinion that *Mercera et al.* and *Herschkowitz et al.* teach all of the limitations of those claims except for pretreating the catalyst by exposure to air under conditions to oxidize the catalyst, and that *Fujitani et al.* supplies the missing teachings. In reply, Applicants respectfully traverse for at least the same reasons as discussed above. While Applicants do not admit that the references are even combinable as proposed by the Examiner, even if their teachings were considered together one would still not have the process of claim 32 or the catalyst of 38 because there is no express or inherent teaching in those references that would give the resulting rhodium oxide catalyst exactly the same characteristics as that of Applicants' claims, as discussed above with respect to the rejection of claims 30 and 37 from which claims 32 and 38 respectively depend.

New Claims

New claim 39 is supported in the specification in paragraph [0022]; new claim 40 is supported by original claim 4; new claim 41 is supported in the specification in paragraph [0032]; new claim 42 is supported in paragraphs [0017] and [0032]; and new claim 43 finds support in the specification in paragraphs [0030], [0032] and [0022]. Each of these claims distinguishes and is nonobvious over the cited references for at least the same reasons as claims 3, 30 and 37, as discussed above with respect to the rejections under 35 U.S.C. § 102(b) and § 103(a).

Notice of Co-pending Application

Pursuant to 37 C.F.R. § 1.56 and MPEP 2001.06(b), Applicant brings to the Examiner's attention co-owned, co-pending U.S. Patent Application No. 09/838,124 filed April 19, 2001 entitled "Rhodium Cloth Catalyst for Partial Oxidation of Hydrocarbons." The claims of that application are patentably distinct from the claims in the instant application. This submission is not an admission that either application is material to patentability of the other.

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C. nclusion

Applicants may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other arguments with respect to patentability which have yet to be raised, but which may be raised in the future. The format of this Amendment and Response to Office Action is believed to conform with the

All of the pending claims are believed to be free of the prior art, and reconsideration and withdrawal of the rejections are respectfully requested. If a telephone conference would facilitate the resolution of this matter, the Examiner is invited to telephone the undersigned representative. Should any fees have been inadvertently omitted, or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to Conley Rose, P.C., Deposit Account Number 00-2769 and consider this a petition for any necessary extension of time.

Respectfully submitted,



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